REMARKS

Claims 1-51 were originally filed in the present application. No claims are currently canceled or added. Consequently, claims 1-51 remain pending in the present application. Reconsideration of the present application in light of the above amendments and the following remarks is respectfully requested.

Claims 1, 20, 26, 30, 36, 42 and 51 have been amended to clarify that the splat hierarchy is built from the hierarchical node data without converting the node data to mesh data. Support for this subject matter can be found at paragraphs [0006]-[0007] and paragraphs [0021]-[0022] of the specification: "[0006] ... Typically, rendering utilizing such splats employs triangular mesh data as an input, requiring solid volume data (e.g., voxel data) or non-triangular mesh data to be converted to triangular mesh data before splat generation. While providing some improvement over the marching cubes algorithm and other previous rendering techniques, the conversion of the mesh data into a splat hierarchy also requires substantial computing resources. [0007] Accordingly, what is needed in the art is a system and method that addresses the above-discussed issues.... [0021] The method 100 also includes a step 120 in which leaf node splats each corresponding to one of the leaf nodes are determined. Step 120 may include determining a leaf node splat for each of the leaf nodes in the hierarchical data provided in step 110, or a subset thereof. Each of the leaf node splats is based on scalar values corresponding to at least one of the leaf nodes.... [0022] The method 100 also includes a step 130 in which non-leaf node splats each corresponding to one of the plurality of non-leaf nodes are determined. Step 130 may include determining a non-leaf node splat for each of the non-leaf nodes in the hierarchical data provided in step 110, or a subset thereof. Each of the plurality of non-leaf node splats are based on a plurality of splats each corresponding to a lower hierarchical node...."

Rejections under 35 U.S.C. §102

Claim 1

Claim 1 recites:

> 1. A method of extracting isosurface data from hierarchical node data, comprising:
>
> providing hierarchical node data representing an object, the hierarchical node data including a lowest hierarchy level having a plurality of leaf nodes and a plurality of higher hierarchy levels each having a plurality of non-leaf nodes each encompassing ones of the plurality of leaf nodes; and
>
> building a splat hierarchy from the hierarchical node data without converting the hierarchical node data into mesh data, wherein building the splat hierarchy comprises:
>
>> determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes; and
>>
>> determining a plurality of non-leaf node splats each corresponding to one of the plurality of non-leaf nodes that includes a portion of the isosurface, each of the plurality of non-leaf node splats based on a plurality of splats each corresponding to a lower hierarchical node.

Claim 1 was rejected under 35 U.S.C. §102(b) as being anticipated by Jane Wilhelms & Allen Van Gelder, *Octrees for Faster Isosurface Generation*, vol. 11, no. 3, ACM TRANSACTIONS ON GRAPHICS, 201 (1992), herein referred to as "Wilhelms."

The PTO provides in MPEP §2131 that:

> *"[t]o anticipate a claim, the reference must teach every element of the claim...."*

Therefore, to sustain this rejection with respect to claim 1, Wilhelms must contain all of the above claimed elements of the claim. However, Wilhelms does not disclose building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data. In contrast, Wilhelms describes a method of converting volume data contained in an octree to mesh data: "A popular method for isosurface generation is to imagine the volume as consisting of cells whose corners are the sample values [3, 5, 13, 26, 27]. Each cell is examined

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one by one for the presence of an isosurface, which is detected when at least one corner value is above and another below the threshold value. If the isosurface intersects the cell, intersection points along the cell edges are calculated and become the vertices of polygons representing the portion of the isosurface within that cell. Lorensen and Cline introduced a table-lookup method to speed polygon generation [13]." (Wilhelms, pg. 205, second paragraph of Section 2).

Accordingly, as explained above, Wilhelms fails to teach each and every element of claim 1, such that the §102 rejection of claim 1 is not supported by Wilhelms. Consequently, Applicants respectfully request the Examiner withdraw the §102 rejection of claim 1 and its dependent claims.

Claim 20

Claim 20 recites:

20. A method of rendering isosurface data, comprising:
providing hierarchical node data representing an object having an isosurface, the hierarchical node data including a lowest hierarchy level having a plurality of leaf nodes and a plurality of higher hierarchy levels each having a plurality of non-leaf nodes each encompassing ones of the plurality of leaf nodes;
building a splat hierarchy from the hierarchical node data without converting the hierarchical node data into mesh data, wherein building the splat hierarchy comprises:
determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes; and
determining a plurality of non-leaf node splats each corresponding to one of the plurality of non-leaf nodes that includes a portion of the isosurface, each of the plurality of non-leaf node splats based on a plurality of splats each corresponding to a lower hierarchical node; and
rendering a plurality of splats partially populating the splat hierarchy resulting from the determination of the pluralities of leaf node splats and non-leaf node splats.

Claim 20 was also rejected under 35 U.S.C. §102(b) as being anticipated by Wilhelms. Therefore, to sustain this rejection, Wilhelms must contain all of the above elements recited in

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claim 20. However, in much the same manner as described above with regard to claim 1, Wilhelms does not disclose building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data in the context of claim 20, or otherwise. Accordingly, the §102 rejection of claim 20 is not supported by Wilhelms. Consequently, Applicants respectfully request the Examiner withdraw the §102 rejection of claim 20 and its dependent claims.

Claim 26

Claim 26 recites:

26. A processing system for extracting isosurface data from hierarchical node data, comprising:

means for providing hierarchical node data representing an object, the hierarchical node data including a lowest hierarchy level having a plurality of leaf nodes and a plurality of higher hierarchy levels each having a plurality of non-leaf nodes each encompassing ones of the plurality of leaf nodes; and

means for building a splat hierarchy from the hierarchical node data without converting the hierarchical node data into mesh data, wherein the means for building the splat hierarchy comprises:

means for determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes; and

means for determining a plurality of non-leaf node splats each corresponding to one of the plurality of non-leaf nodes that includes a portion of the isosurface, each of the plurality of non-leaf node splats based on a plurality of splats each corresponding to a lower hierarchical node.

Claim 26 was also rejected under 35 U.S.C. §102(b) as being anticipated by Wilhelms. Therefore, to sustain this rejection, Wilhelms must contain all of the above elements recited in claim 26. However, in much the same manner as described above with regard to claims 1 and 20, Wilhelms does not disclose building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data in the context of claim 26, or otherwise. Accordingly, the §102 rejection of claim 26 is not supported by Wilhelms. Consequently,

Applicants respectfully request the Examiner withdraw the §102 rejection of claim 26 and its dependent claims.

Claim 30

Claim 30 recites:

> 30. A processing system for rendering isosurface data, comprising:
> means for providing hierarchical node data representing an object, the hierarchical node data including a lowest hierarchy level having a plurality of leaf nodes and a plurality of higher hierarchy levels each having a plurality of non-leaf nodes each encompassing ones of the plurality of leaf nodes;
> means for building a splat hierarchy from the hierarchical node data without converting the hierarchical node data into mesh data, wherein the means for building the splat hierarchy comprises:
>> means for determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes; and
>> means for determining a plurality of non-leaf node splats each corresponding to one of the plurality of non-leaf nodes that includes a portion of the isosurface, each of the plurality of non-leaf node splats based on a plurality of splats each corresponding to a lower hierarchical node; and
> means for rendering a plurality of splats partially populating the splat hierarchy.

Claim 30 was also rejected under 35 U.S.C. §102(b) as being anticipated by Wilhelms. Therefore, to sustain this rejection, Wilhelms must contain all of the above elements recited in claim 30. However, in much the same manner as described above with regard to claims 1, 20 and 26, Wilhelms does not disclose building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data in the context of claim 30, or otherwise. Similarly, and necessarily in view of the above, Wilhelms also fails to disclose rendering a plurality of splats partially populating a splat hierarchy. Accordingly, the §102 rejection of claim 30 is not supported by Wilhelms. Consequently, Applicants respectfully request the Examiner withdraw the §102 rejection of claim 30 and its dependent claims.

Claim 36

Claim 36 recites:

> 36. A program product, comprising:
> a computer-readable storage medium;
> means recorded on the medium for providing hierarchical node data representing an object, the hierarchical node data including a lowest hierarchy level having a plurality of leaf nodes and a plurality of higher hierarchy levels each having a plurality of non-leaf nodes each encompassing ones of the plurality of leaf nodes;
> means recorded on the medium for building a splat hierarchy from the hierarchical node data without converting the hierarchical node data into mesh data, wherein the means for building the splat hierarchy comprises:
>> means recorded on the medium for determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes; and
>> means recorded on the medium for determining a plurality of non-leaf node splats each corresponding to one of the plurality of non-leaf nodes that includes a portion of the isosurface, each of the plurality of non-leaf node splats based on a plurality of splats each corresponding to a lower hierarchical node.

Claim 36 was also rejected under 35 U.S.C. §102(b) as being anticipated by Wilhelms. Therefore, to sustain this rejection, Wilhelms must contain all of the above elements recited in claim 36. However, in much the same manner as described above with regard to claims 1, 20, 26 and 30, Wilhelms does not disclose building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data in the context of claim 36, or otherwise. Accordingly, the §102 rejection of claim 36 is not supported by Wilhelms. Consequently, Applicants respectfully request the Examiner withdraw the §102 rejection of claim 36 and its dependent claims.

<u>Claim 42</u>

Claim 42 recites:

> 42. A program product, comprising:
> a computer-readable storage medium;
> means recorded on the medium for providing hierarchical node data representing an object, the hierarchical node data including a lowest hierarchy level having a plurality of leaf nodes and a plurality of higher hierarchy levels each having a plurality of non-leaf nodes each encompassing ones of the plurality of leaf nodes;
> means recorded on the medium for building a splat hierarchy from the hierarchical node data without converting the hierarchical node data into mesh data, wherein the means for building the splat hierarchy comprises:
>> means recorded on the medium for determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes; and
>> means recorded on the medium for determining a plurality of non-leaf node splats each corresponding to one of the plurality of non-leaf nodes that includes a portion of the isosurface, each of the plurality of non-leaf node splats based on a plurality of splats each corresponding to a lower hierarchical node; and
> means recorded on the medium for rendering a plurality of splats partially populating the splat hierarchy.

Claim 42 was also rejected under 35 U.S.C. §102(b) as being anticipated by Wilhelms. Therefore, to sustain this rejection, Wilhelms must contain all of the above elements recited in claim 42. However, in much the same manner as described above with regard to claims 1, 20, 26, 30 and 36, Wilhelms does not disclose building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data in the context of claim 42, or otherwise. Accordingly, the §102 rejection of claim 42 is not supported by Wilhelms. Consequently, Applicants respectfully request the Examiner withdraw the §102 rejection of claim 42 and its dependent claims.

Claim 51

Claim 51 recites:

51. A method of extracting isosurface data from a scalar field, comprising:
 providing scalar field data; and
 building a splat hierarchy from the scalar field data without converting the scalar field data into mesh data, including:
  determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes; and
  determining a plurality of non-leaf node splats each based on a plurality of lower hierarchical splats.

Claim 51 was also rejected under 35 U.S.C. §102(b) as being anticipated by Wilhelms. Therefore, to sustain this rejection, Wilhelms must contain all of the above elements recited in claim 51. However, in much the same manner as described above with regard to claims 1, 20, 26, 30, 36 and 42, Wilhelms does not disclose building a splat hierarchy from scalar field data without converting the scalar field data into mesh data in the context of claim 51, or otherwise. Accordingly, the §102 rejection of claim 51 is not supported by Wilhelms. Consequently, Applicants respectfully request the Examiner withdraw the §102 rejection of claim 51 and its dependent claims.

Rejections Under 35 U.S.C. §103

Claims 7, 18, 28, 39-41 and 48-50 were rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 6,279,007 to Uppala ("Uppala") in view of Chun-Fa Chang, et al., *LDI Tree: A Hierarchical Representation for Image-Based Rendering*, INTERNATIONAL CONFERENCE ON COMPUTER GRAPHICS AND INTERACTIVE TECHNIQUES, 291 (1999), herein referred to as "Chang." Applicants traverse this rejection on the grounds that these references are defective in establishing a *prima facie* case of obviousness with respect to claims 1, 26, 36 and 42 and, thus, their dependent claims, for at least the following reasons.

As provided in 35 U.S.C. §103:

A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the <u>subject matter as a whole</u> would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ... (Emphasis added)

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. However, Uppala and Chang each independently fail to teach or suggest building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data. In contrast, Uppala merely discloses an architecture for managing query friendly hierarchical values (column 3, lines 1-3), and makes no mention of building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data. Chang merely teaches using the techniques of splatting and meshing to deal with disocclusion artifacts (page 291, section 1), and fails to teach building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data. Thus, it is evident that Uppala and Chang, whether taken separately or together, fail to teach or suggest building a splat hierarchy from hierarchical node data without converting the hierarchical node data into mesh data. Therefore, the combination of Uppala and Chang necessarily fails to teach or suggest each and every element recited in any one of the independent claims 1, 26, 36 and 42 and, thus, their dependent claims. Consequently, the combination of Uppala and Chang fails to support a *prima facie* case of obviousness, and the explicit terms of §103 cannot be met. Accordingly, Applicants respectfully request the Examiner withdraw the §103 rejection of claims 7, 18, 28, 39-41 and 48-50.

Conclusion

All matters set forth in the Office Action have been addressed. Accordingly, it is believed that all claims are in condition for allowance. Favorable consideration and an early indication of allowability are respectfully requested.

Should the Examiner deem that an interview with Applicants' undersigned attorney would expedite consideration, the Examiner is invited to call the undersigned attorney at the telephone number indicated below.
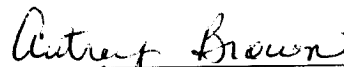
Respectfully submitted,

Dave R. Hofman
Registration No. 55,272

Dated: March 30, 2007

HAYNES AND BOONE, LLP
901 Main Street, Suite 3100
Dallas, Texas 75202-3789
Telephone: 972/739-8630
Facsimile: 214/200-0853
Attorney Docket No.: 34003.100
Document No.: H-664372.1

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Susan Jones

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